Project: China's urbanization and its sustainability under future climate change

Funding Sponsor: NASA Land Use Land Cover Change Program

Overarching Goal: The overarching goal of this project is to understand how urban expansion, climate change, and adaptation relate in China

Objectives:
(1) to assess the level of sustainable urban development in China,
(2) to analyze the causal linkages between urbanization, urban sprawl, and climate change,
(3) to simulate local scale IPCC climate scenarios for selected cities, and
(4) to evaluate current adaptation strategies and provide adaptation recommendations for various future climate scenarios to urban policy makers.

Summary:
Driven by fast economic development and relaxation of the urban migration restrictions, China has experienced rapid urbanization over the past three decades. This urban transformation has profound environmental impacts, with regional climate change as the most direct presentation. AGS's role is focused on improving urban change products by combining SAR and optical imagery. Current efforts are focused on fusing SAR measurements with optical data over regions to improve mapping accuracy and detail of LULC attributes. In this task we fuse Landsat and PALSAR to generate maps for Urumqi and Shanghai, China. The primary advantage of SAR data is its ability to penetrate canopies and its sensitivity to structure, water content, and biomass independent of weather conditions. The primary advantage of Landsat is its consistent repeat cycle, spectral coverage, spatial resolution, and availability. Together we are developing advanced maps for selected cities in China which are then integrated into the modeling framework. Historical maps are generated from archived USGS Landsat and Classification and Regression Tree algorithms. Classification and regression tree algorithms utilize rule-based models for prediction of discrete/continuous variables based on training data. Unlike neural network, the trees developed by CART algorithms are interpretable and easy to use. CART can produce either classification or regression trees, depending on whether the dependent variable is categorical or numeric, respectively. By using a non-parametric CART methodology the fusion of PALSAR and Landsat to generate maps is seamless. Further, by using the LCCS framework, change assessment from year to year is possible.

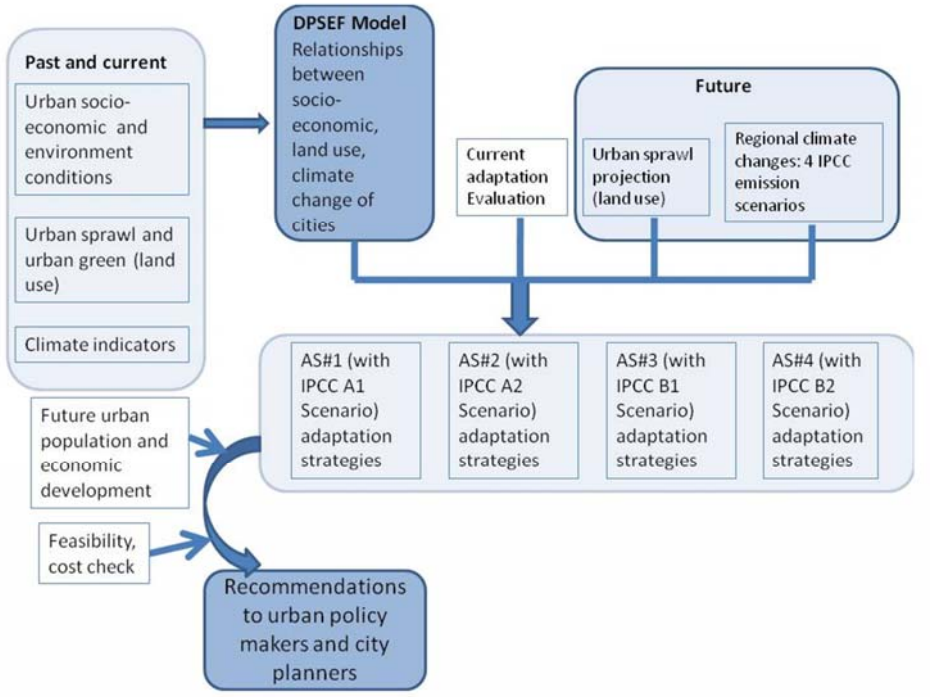

Figure: A system approach: socioeconomic and environment conditions, urban sprawl, and future climate changes and implications for adaptation strategies.

We are evaluating past and current adaptation strategies of local governments in dealing with the climate change impacts. Extensive field work and interviews are being conducted to collect related data, including policy measures, regulations, and planning and zoning documents, from local governments, with the help of our local collaborators in Shanghai and Urumqi. We are also incorporating socio-economic models developed by current literature and collect data such as public health (respiratory disease) and mortality rate related to extreme weathers, energy consumption related to weather change, and urban poor locations.

Based on simulation results of future LULC and climate under different IPCC emission scenarios (A1, A2, B1, and B2), we will provide corresponding policy recommendations that can help local governments of Shanghai and Urumqi to deal with and adapt to future climate change. A database of tools for adaptation and mitigation catering to the specific needs of Shanghai and Urumqi will be constructed.